

CLAIMS

1. A monitoring apparatus for an ambulatory subject including:
 - a portable monitor mountable on the subject that includes an accelerometer that determines the instant acceleration of the subject in one or more determined directions;
 - a processing unit that:
 - a) determines at least one instant ambulatory performance indicia of the subject from at least one determined instant acceleration of the subject in one or more instants of time;
 - b) determines at least one designated performance threshold from at least one previously determined instant ambulatory performance indicia;
 - c) determines if the subject's instant ambulatory performance indicia is below or above the at least one designated performance threshold;
 - d) initiates at least one event if the determined instant ambulatory performance indicia is above or below the determined at least one designated performance threshold; and
 - a communications unit that communicates an initiated event to a remote receiver.
- 15 2. A monitoring apparatus in accordance with claim 1 wherein the at least one designated performance threshold is determined by the processing unit from a plurality of previously determined instant ambulatory performance indicia.
- 20 3. A monitoring apparatus in accordance with claim 1 wherein the at least one event is initiated only if the determined instant ambulatory performance indicia is below or above the determined at least one designated performance threshold for a designated period of time.
4. A monitoring apparatus in accordance with claim 3 wherein the designated first period of time is determined from a plurality of previously determined instant ambulatory performance indicia.
- 25 5. A monitoring apparatus in accordance with claim 1 wherein the accelerometer simultaneously determines the acceleration of the subject in three orthogonal directions.
- 30 6. A monitoring apparatus in accordance with claim 5 wherein the portable monitor is configured to be mounted on an upright ambulatory such that one of the three orthogonal directions is in a vertical direction or within a designated angle of the vertical direction.
7. A monitoring apparatus in accordance with claim 1 wherein an initiated event is communicated by the apparatus to the remote receiver by wireless communication.
- 35 8. A monitoring apparatus in accordance with claim 3 wherein:

- a first instant ambulatory performance indicia representative of movement activity in the subject is determined from the instant magnitude of the sum of the instant acceleration of the subject in one or more determined directions;
- a first acceleration threshold magnitude that is representative of a lack of normal expected subject movement is designated as a first designated performance threshold;
- a first event representative of an absence of a normal amount of movement in the subject indicative of a possible inability to rise due to a collapse or other adverse event is initiated if the determined first instant ambulatory performance indicia is below the first designated acceleration threshold magnitude for a first designated period of time.

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9. A monitoring apparatus in accordance with claim 8 wherein:

- a second instant ambulatory performance indicia representative of the instant crano-caudal angle of the subject relative to an upright disposition of the subject, is determined from at least one of the determined instant acceleration of the subject in one or more determined directions;
- an angle magnitude that is representative of a crano-caudal angle of the subject relative to an upright subject where the disposition of the subject is deemed to be no longer upright is designated as a second designated performance threshold;
- a second acceleration threshold magnitude representative of an abnormally high subject movement is designated as a third designated performance threshold; and
- a second event representative of an abnormal acceleration of the subject followed by a laying down subject disposition indicative of a possible fall coupled with a subsequent absence of getting up from the laying down disposition indicative of a possible debilitating fall is initiated if:
 - a) the determined first instant ambulatory performance indicia is above the second designated acceleration threshold for a second designated period of time; and
 - b) within a third designated period of time of the end of the second designated period of time the determined second instant ambulatory performance indicia is greater than the designated angle threshold; and then
 - c) the determined first instant ambulatory performance indicia is below the first designated acceleration threshold magnitude for a first designated period of time.

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10. A method of monitoring an ambulatory subject including:

- mounting a portable monitor on the subject that is in wireless communication with a remote receiver, wherein the monitor includes an accelerometer to determine simultaneously the instant acceleration of the subject in at least three different directions at different instants in time;
- determining a plurality of instant ambulatory performance indicia based on the determined instant acceleration of the subject;
- determining at least one designated performance threshold corresponding to each ambulatory performance indicia from at least one previously determined corresponding instant ambulatory performance indicia;

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- 19 -

- determining if the subject's instant ambulatory performance indicia is below or above the corresponding at least one designated performance threshold and initiating a corresponding event;
- communicating a designated initiated event to the remote receiver.

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11. A method of monitoring an ambulatory subject in accordance with claim 10 wherein the at least one designated performance threshold is determined from a plurality of previously determined instant performance indicia, and the designated performance threshold can responsively and cooperatively adapt to statistical changes in previously determined instant performance indicia over time.

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12. A method of monitoring an ambulatory subject in accordance with claim 10 wherein the event is initiated only if the determined instant ambulatory performance indicia is below or above the determined at least one designated performance threshold for a designated period of time.

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13. A monitoring apparatus for an ambulatory subject including:

- a portable monitor mountable on the subject that includes an accelerometer that simultaneously determines the instant acceleration of the subject in at least three different directions;
- a processing unit that:
 - a) determines the instant magnitude of the sum of the instant acceleration of the subject in the at least three different directions;
 - b) determines if the determined instant magnitude does not exceed a first designated acceleration threshold magnitude for a first designated period of time, where the first designated acceleration threshold magnitude is representative of a lack of normal expected subject movement;
 - c) initiates an event representative of an absence of a normal amount of movement in the subject indicative of a possible inability to rise due to a collapse or other adverse event if the determined instant magnitude does not exceed the first designated acceleration threshold magnitude for at least the first designated period of time; and
- a communications unit that communicates an initiated event to a remote receiver.

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14. A monitoring apparatus in accordance with claim 13 wherein:

- the processing unit:
 - a) determines if the determined instant magnitude of the sum of the instant acceleration of the subject in the at least three different directions exceeds a second designated acceleration threshold magnitude for at least a second designated period of time;
 - b) determines the magnitude of the instant angle of the subject being the magnitude of the angle between the cranio-caudal axis of the subject and the cranio-caudal axis of the subject when in an upright disposition from at least one of the determined instant acceleration of the subject in one or more determined directions;

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- 20 -

c) determines if the determined instant angle of the monitor is greater or less than a designated angle magnitude threshold; and

d) initiates an event representative of an abnormally high acceleration of the subject followed by a laying down subject disposition indicative of a possible fall coupled with a subsequent absence of getting up from the laying down disposition indicative of a possible debilitating fall if:

I. the determined instant magnitude of the sum of the instant acceleration of the subject in the at least three different directions exceeds the second designated acceleration threshold magnitude for at least a second designated period of time; and

II. within a third designated period of time after the end of the second designated period of time the determined instant angle of the subject is greater than the designated angle magnitude threshold; and

III. within the third designated period of time after the end second designated period of time the instant magnitude of the sum of the instant acceleration of the subject in the at least three different directions does not exceed a third designated acceleration magnitude for at least a fourth designated period of time.

15. A monitoring apparatus in accordance with claim 13 wherein the accelerometer simultaneously determines the acceleration of the subject in three orthogonal directions.

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16. A monitoring apparatus in accordance with claims 14 wherein the portable monitor is mounted on an upright subject in an orientation so that one of the three orthogonal directions is in a vertical direction or within a designated angle of the vertical direction.